

Version of Page 5, line 33 to Page 6, line 10 showing changes made

(2) A simple graphical schematic of the permissible inverter to motor windings connections may thus be described for a polyphase motor having N phases. In the following embodiment, N is equal to 9, but it is to be understood that this limitation is made to better illustrate the invention; other values for N are also considered to be within the scope of the present invention. Fig. 2a shows 9 evenly spaced terminals 4 and a center terminal 6. Each of the terminals 4 represent one end of a motor winding 1 and the center terminal 6 represents the other end of the motor winding. An inverter 5 has 9 terminals 2, which are connected to one of the terminals 4 of each of the motor windings 1 via electrical connectors 3 as shown.

Permissible connections of the 9 phase windings are either from the center point, to each of the 9 points on the circle (this being the star connection shown as Fig. 2a) or from each of the 9 points to another point S skipped points distant in the clockwise direction, where S represents the number of skipped points (inverter terminals). This latter is shown in Figs. 2b-e; in Fig. 2b motor winding 1 is represented by a line, and in Figs. 2c-e inverter 5 and electrical connectors 3 have been omitted for the sake of clarity. It will be noted that for each S from 0 to 3 there is a corresponding S from 4 to 7 that produces a mirror image connection.

Version of Page 6, line 11 to Page 6, line 31 showing changes made

C3 Fig. 2 shows all permissible connections for a 9 phase system from S=0 to S=4 as well as the star connection. Noted on the star connection diagram (Fig. 2a) are the relative phase angles of the inverter phases driving each terminal. For a given inverter output voltage, measured between an output terminal 2 and the neutral point, 6 each of these possible connections will place a different voltage on the connected windings. For the star connection, the voltage across the connected windings is exactly equal to the inverter output voltage. However, for each of the other connections (Figs. 2b-e), the voltage across a winding is given by the vector difference in voltage of the two inverter output terminals 2 to which the winding 1 is connected. When this phase difference is large, then the voltage across the winding will be large, and when this phase difference is small, then the voltage across the winding will be small. It should be noted that the inverter output voltage stays exactly the same in all these cases, just that the voltage difference across a given winding will change with different connection spans. The equation for the voltage across a winding is given by:

$$2 * \sin((\text{phasediff})/2) * V_{\text{out}}$$

where phasediff is the phase angle difference of the inverter output terminals driving the winding, and V is the output to neutral voltage of the inverter.

Version of Page 6, line 33 to Page 7, line 9 showing changes made

C4 Thus, referring to Fig. 2, when  $S=0$ , the phase angle difference is 40 degrees, and the voltage across a winding is  $0.684V_{out}$ . When  $S=1$  (Fig. 2c), the phase angle difference is 80 degrees, and the voltage across the winding is  $1.29V_{out}$ . When  $S=2$  (Fig. 2d), the phase angle difference is 120 degrees, and the voltage across the winding is  $1.73V_{out}$ . Finally, when  $S=3$  (Fig. 2e), the phase angle difference is 160 degrees, and the voltage across the winding is  $1.97V_{out}$ . For the same inverter output voltage, different connections place different voltage across the windings, and will cause different currents to flow in the windings. The different mesh connections cause the motor to present a different impedance to the inverter.

As disclosed above, in an induction machine, each motor winding set can be described by two terminals. There may be a larger number of terminals, but these are always grouped in series or parallel groups, and the entire set can be characterized by two terminals. Thus whilst Fig. 2 discloses a single motor winding 1 connected to terminals 4 and 6, it is to be understood that this limitation is made to better illustrate the invention; multiple phase windings connected between the terminals are also considered to be within the scope of the present invention.

**Version of Amended Claim 34 with markings to show changes made**

34. (Amended) A high phase order induction machine drive system, comprising
- a) an inverter system for the synthesis of a plurality of phases of alternating current output, each phase electrically connected to at least one inverter terminal, and
  - b) an induction motor comprising N phases, where N is greater than 3, connected mesh to said inverter terminals, said mesh characterized in that:  
each motor phase is electrically connected to[ ]:  
(i) a first inverter terminal, and[ ]:  
(ii) a second inverter terminal S (+ 1)skipped inverter terminals distant from [the]said first inverter terminal in order of electrical phase angle, where S is the skip number, and represents the number of skipped terminals;  
and the phase angle difference between the [pair of]two inverter terminals to which each motor phase is connected is identical for each motor phase.

Version of Amended Claim 42 with markings to show changes made

42. The high phase order induction machine drive system of claim 3[5]4 wherein said alternating current output is selectable between a fundamental frequency component and a fundamental frequency component multiplied by three.

**Version of Amended Claim 50 with markings to show changes made**

50. The high phase order induction machine drive system of claim [34]49  
wherein  $S = (N-3)/2$ .

**Version of Amended Claim 67 with markings to show changes made**

67. The high phase order induction machine drive system of claim 34 wherein said [windings]motor phases comprise a single inductor[s] per slot.

Version of Amended Claim 83 with markings to show changes made

83. A high phase order induction motor having more than three phases, connected to inverter output elements with a mesh connection, said mesh characterized in that: each motor phase is electrically connected to a first inverter terminal and a second inverter terminal S [+ 1]skipped inverter terminals distant from the first inverter terminal in order of electrical phase angle, where S is the skip number, and the phase angle difference between the pair of inverter terminals to which each motor phase is connected is identical for each motor phase.

**Version of Amended Claim 84 with markings to show changes made**

84. The high phase order induction machine of claim 83 wherein N is the number of phases of the motor, and wherein N is odd and wherein  $S = (N-3)/2$ .

**Version of Amended Claim 88 with markings to show changes made**

88. The high phase order induction motor of claim 83 wherein  $S = 0$ .

Version of Amended Claim 89 with markings to show changes made

89. The high phase order induction motor of claim 83 wherein N is the number of phases of the motor, and wherein  $S = (N/3) - 1$ , rounded to the nearest integer.